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UNIVERSITY OF MINNESOTA
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COD LIVER OIL IN THE WINTER RATION OF PULLETS

RESULTS OF A THREE-YEAR STUDY OF THE EFFECTS ON EGG PRODUCTION AND THE HATCHING POWER OF THE EGGS LAID

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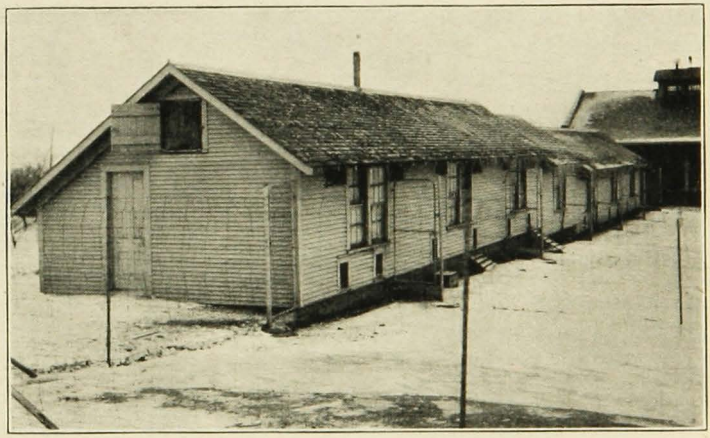


UNIVERSITY FARM, ST. PAUL

COD LIVER OIL IN THE WINTER RATION OF PULLETS

RESULTS OF A THREE-YEAR STUDY OF EFFECTS ON EGG PRODUCTION AND THE HATCHING POWER OF THE EGGS LAID

ALLEN W. EDSON

Poultry raising is one of the leading and dependable sources of income on the average Minnesota farm. The profit from the flock depends largely upon how many eggs are produced and the proportion of these eggs are laid in the winter months when, under normal conditions, higher prices prevail. High winter egg production depends upon good breeding, feeding, housing, and care. These facts are quite well appreciated by the average poultryman who is endeavoring to get high production from his flock. Under Minnesota conditions, a long period of confinement is necessary during the winter season. The lack of direct sunshine and the resulting deficiency of vitamin D caused by the necessary confinement in the laying house, has a tendency to lower egg production and also to lower the hatching power of the eggs. To correct these conditions the use of cod liver oil has been generally recommended.

PLAN OF EXPERIMENT

Experiments were planned and carried on at the West Central Experiment Station, Morris, Minnesota, between 1927 and 1931. The pens were arranged as follows:

	No. of birds per pen	Percentage of cod liver oil given to each pen		
		Pen I	Pen II	Pen III
First year	43	0	1	2
Second year	80	0	2	3
Third year	80	0	2	3

During the first year three pens of single-comb White Leghorns were used, each containing 43 birds. The birds in the first pen, used as a check, were fed a mash containing no cod liver oil; those in the second pen were fed a mash containing one per cent; and those in the third pen received a mash containing 2 per cent. The feeding of cod liver oil was begun on January 1 and continued throughout January, February, March, and April. During the second year of the trials, three pens of White Leghorn pullets of 80 birds each were used. The birds in one pen received no cod liver oil; those in a second, a mash containing 2 per cent, and those in the third a mash containing 3 per cent. The cod liver oil feeding was begun November 1 and continued

through April. During the third year, the experiments of the previous year were repeated, but feeding was continued through May.

METHODS OF FEEDING

Ration used first year

Scratch grain	Laying Mash
50% Wheat	50% Ground wheat
25% Oats	24% Ground oats
25% Barley	25% Ground barley
	1% Salt

Skimmilk or buttermilk and no water was given for drink.

Ration used second and third years

Scratch grain	Laying Mash
50% Wheat	23% Wheat bran
25% Oats	23% Ground oats
25% Barley	22% Ground barley
	23% Wheat middlings
	3% Bonemeal
	5% Meat scraps
	1% Salt

Skimmilk or buttermilk and no water was given for drink.

In the three years the grain was fed three times a day, scattered in a litter of straw three to four inches deep. The evening feed of grain was fully as heavy as the other two feeds. The mash was fed dry and was kept before the birds at all times in large self-feeders. To this mash the cod liver oil was added in amounts from none to 3 per cent.

In mixing the cod liver oil with the mash, it was found best to mix it first with about a half pail of mash and after this was thoroly mixed to scatter it over the large pile of feed and then shovel the entire lot in the ordinary manner. If the mixture containing the oil is scattered on the pile before the separate feeds are mixed, no additional mixing will be necessary. Several brands of cod liver oil were used, all of which had been biologically tested for their vitamin content and prepared for poultry feeding. Oyster shells were kept before the hens at all times.

SUPPLEMENTS

As the birds received very little animal protein in their mash, they were given all the skimmilk or buttermilk they would drink and no water. On the average Minnesota farm sufficient skimmilk is available for poultry feeding and when this is the case it can largely take the place of meat scraps, which is the most expensive part of the ration. If the milk had been omitted, or fed in smaller amounts, animal protein would have been needed in the mash. Thus it is possible to have the greater part of the feeding ration made up of farm produced feeds.

Succulent and green feeds were fed daily in the form of alfalfa or sprouted oats and roots.

COST OF FEED

The cost of feed used for all three years is based on scratch grain at 1.25 cents per pound; mash containing no cod liver oil at 1.5 cents per pound; mash containing one per cent cod liver oil at 1.68 cents per pound; mash containing 2 per cent cod liver oil at 1.75 cents per pound; and mash containing 3 per cent cod liver oil at 1.88 cents per pound. The cod liver oil was valued at $1.00 per gallon. No charge was made for skimmilk or buttermilk.

FEEDING AND MANAGEMENT

The birds were all kept in the same poultry house throughout the three years of the experiment and were given the same uniform care. In making up the pens, they were carefully selected for uniformity of size and of egg production. There was no apparent difference in the appearance or mortality of the pullets in different pens owing to the cod liver oil fed.

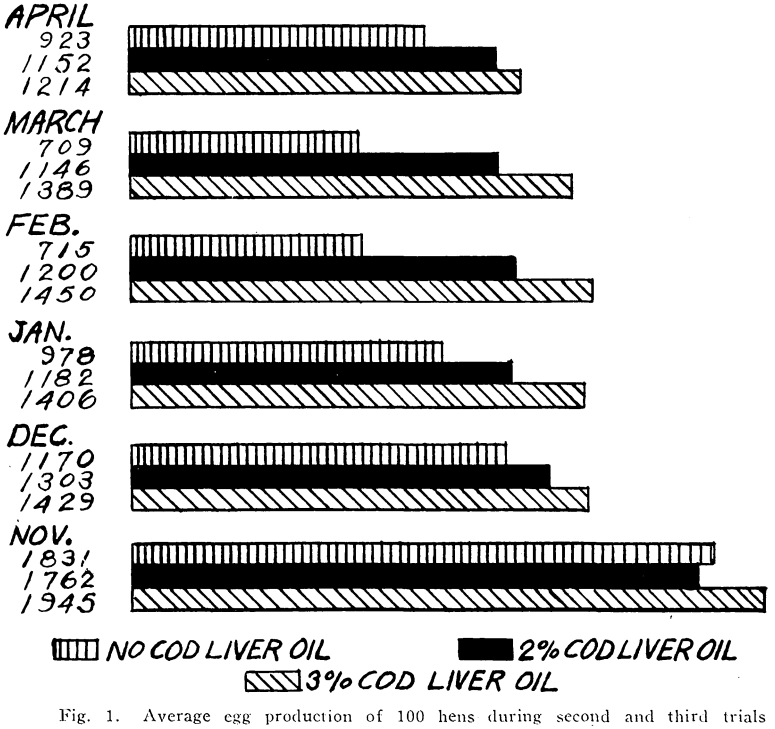


Fig. 1. Average egg production of 100 hens during second and third trials when they were fed cod liver oil in amounts from none to 3 per cent.

Table 1

First Year of Cod Liver Oil Feeding

Effect of Cod Liver Oil on Egg Production

Month	Cod liver oil in mash, per cent	Feed consumed, lb.	No. of eggs laid	No. of eggs laid per lb. of feed	Cost of feed per dozen eggs, cents
		(100 hens)	(100 hens)		
Jan.	0	44.6	784	1.8	9.6
Jan.	1	37.6	742	2.0	9.1
Jan.	2	37.6	872	2.4	8.2
Feb.	0	61.9	1,212	2.0	8.5
Feb.	1	54.9	1,342	2.4	7.1
Feb.	2	54.9	1,660	3.0	5.9
Mar.	0	49.7	1,474	3.0	6.5
Mar.	1	35.8	1,553	4.3	3.7
Mar.	2	42.8	1,802	4.2	4.0
Apr.	0	65.1	1,607	2.5	6.7
Apr.	1	55.8	1,565	2.8	6.3
Apr.	2	65.1	1,914	3.0	6.3
		Average for Four Months			
	0	55.3	1,269	2.3	7.3
	1	46.1	1,300	2.9	6.0
	2	50.1	1,562	3.2	5.3

Birds were turned out March 1.

Table 2

Second Year Cod Liver Oil Feeding

Effect of Cod Liver Oil Feeding on Egg Production

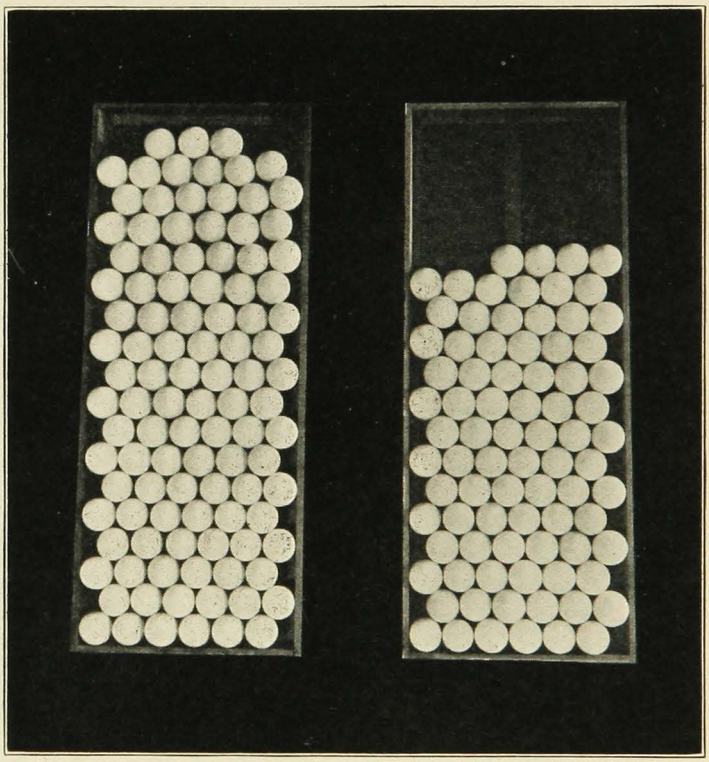
Month	Cod liver oil in mash, per cent	Feed consumed, lb.	No. of eggs laid	No. of eggs laid per lb. of feed	Cost of feed per dozen eggs, cents
		(100 hens)	(100 hens)		
Nov.	0	52.5	1,788	4.2	4.7
Nov.	2	46.9	1,651	3.5	4.6
Nov.	3	45.0	1,833	4.1	4.0
Dec.	0	43.5	740	1.7	9.2
Dec.	2	37.7	884	2.3	6.8
Dec.	3	44.8	1,128	2.5	6.4
Jan.	0	48.2	810	1.7	9.3
Jan.	2	49.7	831	1.7	9.9
Jan.	3	48.9	1,229	2.5	6.6
Feb.	0	31.0	649	2.1	7.8
Feb.	2	34.6	943	2.7	6.7
Feb.	3	39.6	1,363	3.5	5.5
Mar.	0	47.9	741	1.5	10.8
Mar.	2	43.2	1,149	2.7	6.8
Mar.	3	54.0	1,302	2.4	7.9
Apr.	0	47.6	776	1.6	10.1
Apr.	2	49.3	930	1.9	9.7
Apr	3	50.8	1,029	2.0	9.4
		Average for Six Months			
	0	45.2	917	2.1	7.9
	2	43.6	1,065	2.5	7.0
	3	47.2	1,314	2.8	6.4

Birds turned out April 1.

DISCUSSION OF RESULTS

Cod Liver Oil Increases Egg Production

During the first year two pens of 43 birds each were fed cod liver oil at the rates of one per cent and 2 per cent of the mash. The feeding of cod liver oil in this trial, as shown in Table 1, was not begun until January 1. There was a marked effect on the number of eggs laid per pound of feed consumed, in all cases favoring the birds given cod liver oil. The average cost of feed per dozen eggs during the four months when fed a mash containing 2 per cent cod liver oil was only 5.3 cents; the cost of feed per dozen eggs when one per cent cod liver oil was fed was 6 cents. When no cod liver oil was added to the mash the cost per dozen eggs increased to 7.3 cents.



2 per cent cod liver oil. 105 eggs in six months

No cod liver oil. 82 eggs in six months

Fig. 2. Average egg production during the six months of the third trial for hens receiving no cod liver oil and those receiving 2 per cent.

In the second trial, as shown in Table 2, the cod liver oil feeding was begun November 1 instead of January 1, as in the case of the first year's work. In this trial, three pens of White Leghorn pullets containing 80 birds each were used. The birds in one pen received no cod

liver oil; those in the second, 2 per cent; and those in the third pen, 3 per cent. The egg production was but slightly increased by feeding cod liver oil during November. Each succeeding month gave substantially larger increases in egg production for the birds receiving the cod liver oil as compared with those not fed the oil up to the time when they were turned outdoors. During the winter months, beginning in December, the egg production for the hens receiving no cod liver oil remained approximately stationary.

Table 3

Third Year Cod Liver Oil Feeding

Effect of Cod Liver Oil Feeding on Egg Production

Month	Cod liver oil in mash, per cent	Feed consumed, lb.	No. of eggs laid	No. of eggs laid per lb. of feed	Cost of feed per dozen eggs, cents
		(100 hens)	(100 hens)		
Nov.	0	48.8	1,875	3.9	4.1
Nov.	2	48.8	1,873	3.3	4.4
Nov.	3	56.3	2,056	3.7	4.8
Dec.	0	58.4	1,599	2.7	5.8
Dec.	2	59.1	1,723	2.9	5.7
Dec.	3	61.4	1,730	2.8	6.2
Jan.	0	47.3	1,146	2.4	6.5
Jan.	2	49.9	1,532	3.1	5.4
Jan.	3	44.1	1,582	3.6	4.6
Feb.	0	39.8	780	2.0	8.1
Feb.	2	45.9	1,456	3.2	5.4
Feb.	3	41.5	1,537	3.7	4.7
Mar.	0	47.8	677	1.4	11.3
Mar.	2	55.8	1,142	2.1	8.5
Mar.	3	55.3	1,476	2.7	6.8
Apr.	0	62.8	1,070	1.7	9.7
Apr.	2	64.8	1,374	2.1	8.5
Apr.	3	60.4	1,399	2.3	8.1
May	0	66.1	1,026	1.6	10.5
May	2	66.1	1,388	2.1	8.3
May	3	65.2	1,536	2.4	7.7
		Average for Seven Months			
	0	53.0	1,168	2.2	7.3
	2	55.8	1,498	2.7	6.4
	3	54.9	1,616	3.0	6.0

Birds turned out March 1.

During both the second and third trials, the consumption of mash was far below that of scratch feed. If the two could have been maintained more nearly equal, the production of the pens receiving 2 per cent of cod liver oil would perhaps more closely approach the production of those receiving 3 per cent.

During the third trial, a record was kept of all hens laying 200 eggs or more, with results as follows:

	Pen receiving no cod liver oil	Pen receiving 2 per cent cod liver oil	Pen receiving 3 per cent cod liver oil
No. of hens laying over 200 eggs per year	4	17	25

Cod Liver Oil Increases Hatching Power of Eggs

One of the interesting results of these three trials was the effect of cod liver oil on the hatching power of the eggs. In this bulletin all percentages of eggs hatched are based on number of eggs set, not on number of fertile eggs.

Table 4

First Year Cod Liver Oil Feeding

Effect of Cod Liver Oil Feeding on Hatching Power of Eggs

Month eggs were laid	Cod liver oil in mash per cent	Number of eggs set	Per cent of hatch (of eggs set)
Feb.	0	138	28
Feb.	1	138	43
Feb.	2	186	50
Mar.	0	376	49
Mar.	1	396	54
Mar.	2	430	65
Apr.	0	284	60
Apr.	1	309	58
Apr.	2	465	69

Pullets turned out March 1.

Table 4 shows that in the first year eggs laid during February gave only a 28 per cent hatch when no cod liver oil was added to the mash; 43 per cent when one per cent of cod liver oil was added;

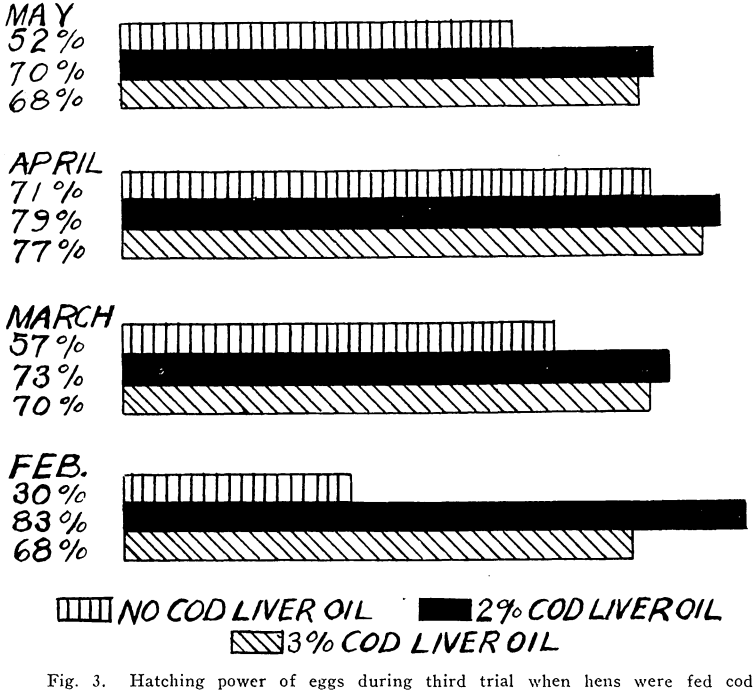
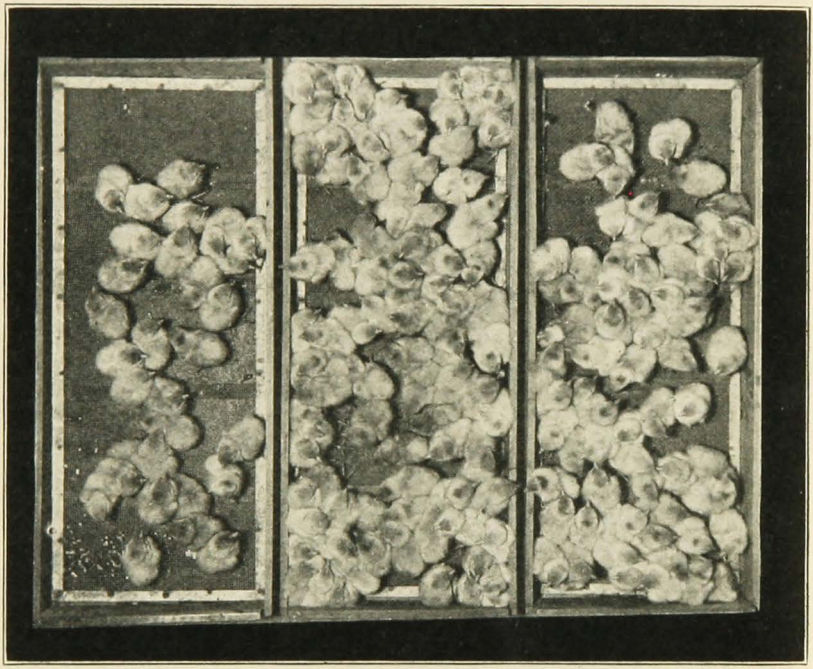


Fig. 3. Hatching power of eggs during third trial when hens were fed cod liver oil in amounts from none to 3 per cent.

and 50 per cent when 2 per cent of cod liver oil was added. During the first year's experiment the pullets were turned out on the range on March 1. It is probable that the deficiency of vitamin D in the control pullets (no oil) was partially corrected by the influence of direct sunlight, because the hatching power of the eggs from this pen was raised to 49 per cent during the month while the pens fed cod liver oil increased to 54 per cent and 65 per cent respectively. By April the effect of the cod liver oil on the hatching power of eggs had practically disappeared.



No cod liver oil. 30 chicks | 2 per cent cod liver oil. 83 chicks | 3 per cent cod liver oil. 68 chicks

Fig. 4. Number of chicks hatched from eggs laid in February during the third year of the experiment when fed cod liver oil in amounts varying from none to 3 per cent.

During the second year's work, outlined in Table 5, the pullets were put on the open range on April 1 and while in confinement during March the 2 per cent cod liver oil pen gave an 11 per cent higher rate of hatch than those receiving no cod liver oil. It is significant that the pen receiving the 3 per cent cod liver oil gave a lower per cent of hatch than those receiving 2 per cent of oil. The same general result was obtained throughout the entire hatching period for both years in which a mash containing 3 per cent of cod liver oil was fed. During the third trial the hatch was increased from 31 to 83 per cent by the addition of 2 per cent cod liver oil to the mash.

Table 5

Second Year Cod Liver Oil Feeding

Effect of Cod Liver Oil Feeding on Hatching Power of Eggs

Month eggs were laid	Cod liver oil in mash per cent	Number of eggs set	Per cent of hatch (of eggs set)
Mar.	0	135	59
Mar.	2	207	71
Mar.	3	228	55
Apr.	0	443	58
Apr.	2	538	73
Apr.	3	543	65
May	0	54	67
May	2	54	85
May	3	108	60

Pullets turned out April 1.

Table 6

Third Year Cod Liver Oil Feeding

Effect of Cod Liver Oil Feeding on Hatching Power of Eggs

Month eggs were laid	Cod liver oil in mash per cent	Number of eggs set	Per cent of hatch (of eggs set)
Feb.	0	167	30
Feb.	2	262	83
Feb.	3	310	68
Mar.	0	333	57
Mar.	2	509	73
Mar.	3	609	70
Apr.	0	331	71
Apr.	2	468	79
Apr.	3	476	77
May	0	128	52
May	2	154	70
May	3	169	68

Pullets turned out March 1.

The principle advantage of feeding cod liver oil appears to come from vitamin D which it contains rather than from vitamin A. This assumption is based on the fact that the birds receiving no cod liver oil improved rapidly in production as did the eggs in hatching power as soon as the hens were turned outdoors and exposed to the direct rays of the sun, regardless of whether or not they obtained any green feed while on the range.

SUMMARY

1. The results of the three seasons' work show that feeding cod liver oil during the winter months to pullets confined in the laying house will increase egg production.

2. The egg production will not only be increased, but the eggs will be produced at a lower cost when the hens are fed a mash containing cod liver oil.
3. Cod liver oil, when fed to pullets confined indoors, very substantially increases the hatching power of eggs.
4. Cod liver oil added to the mash at the rate of 2 per cent seems to be the most economical amount of oil to feed when hatching power and egg production are both considered.